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Estimates of net ecosystem productivity at Jastrebarsko forest eddy covariance site in comparison with other forest sites in FLUXNET

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Net Ecosystem Productivity (NEP) of 35-year-old pedunculate oak (Quercus robur L.) stand was investigated during 2008 and 2009 at eddy covariance (EC) site located in Jastrebarsko pedunculate oak forest, currently undergoing the process of joining FLUXNET network. Two independent methods for assessing NEP were used: 1) eddy covariance; and 2) the "combined" method, using difference between Net Primary Productivity (NPP), assessed with biometric measurements, and heterotrophic respiration (Rh) estimated from soil respiration (SR) measurements.

Maximal measured daily NEP from eddy covariance was 10,7 gC m^{-2} day^{-1} in 2008., and 12,2 gC m^{-2} day^{-1} in 2009. The annual NEP ranged from 384 gC m^{-2} yr^{-1} in 2008 to 584 gC m^{-2} yr^{-1} in 2009 indicating that the stands around the tower were actively storing carbon during both years.

Using weekly measurements of stem increment on 640 dendrometer bands, annual height increment and litter production we obtained an estimate of the NPP of the stands in the footprint of 777 gC m^{-2} yr^{-1} in 2008 and 846 gC m^{-2} yr^{-1} in 2009. Heterotrophic respiration (Rh) , estimated from soil respiration measurements was 438 gC m^{-2} yr^{-1} in 2008 and 441 gC m^{-2} yr^{-1} in 2009. By subtracting Rh from NPP, we obtained NEP of 339 and 405 gC m^{-2} yr^{-1} in 2008 and 2009, respectively.

Comparison of results for NEP during vegetation season reveals that agreement between the two methods was very good until July. Later in the summer and autumn, discrepancy occurs when stem growth ceases but trees continue to actively store carbon. This leads to the underestimation of NEP from combined method during that period, leading to the overall lower values of NEP when compared with NEP values from eddy covariance.

Results of our measurements are compared with other forest sites in FLUXNET network.

Further research is needed that would provide better estimates of Rh, R:S ratio, and related uncertainties in carbon fluxes in pedunculate oak forests.